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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/757,204	01/14/2004	Chih-Ming Ke	TS02-420	3553

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EXAMINER	
NGUYEN, SANG H	
ART UNIT	PAPER NUMBER
2877	

DATE MAILED: 06/09/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

H:A

Office Action Summary	Application No.	Applicant(s)	
	10/757,204	KE ET AL.	
	Examiner	Art Unit	
	Sang Nguyen	2877	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *15 April 2004*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-28* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-28* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *4/15/04*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Information Disclosure Statement

The information disclosure statement (IDS) submitted on 04/15/04 has been entered. The submission is in compliance with the provisions of 37 CFR 1.97. Accordingly, the information disclosure statement is being considered by the examiner.

Oath/Declaration

The oath/declaration filed on 04/15/04 is acceptable.

Drawings

Figure 1 should be designated by a legend such as --Prior Art-- because only that which is old is illustrated. See MPEP § 608.02(g). Corrected drawings in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. The replacement sheet(s) should be labeled "Replacement Sheet" in the page header (as per 37 CFR 1.84(c)) so as not to obstruct any portion of the drawing figures. If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Claim Objections

The claims are objected to because they include reference characters which are not enclosed within parentheses.

Reference characters corresponding to elements recited in the detailed description of the drawings and used in conjunction with the recitation of the same element or group of elements in the claims should be enclosed within parentheses so

as to avoid confusion with other numbers or characters which may appear in the claims. See MPEP § 608.01(m).

With respect to present invention, applicant should remove the reference numbers (i.e., (SE) and BB) in claim 1...). Appropriate correction is required.

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 1, 12,14, 21, and 23 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Regarding claims 1, 12, 14, 21, and 23; the "(n and k) and n and k values" is not clear. What does applicant means "(n and k) and n and k values"?. For examining purposes, Examiner considered the term "(n and k) and n and k values" by –values--.

Regarding claim 23; the "ARC" indefinites. What does applicant mean "ARC"?.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1, 3-6, 8-12, 14-17, and 19-28 are rejected under 35 U.S.C. 103(a) as being unpatentable over Prior Art of Present Invention (Figures 1-3 and 6) in view of Pinaton et al (U.S. Patent No. 6,141,103).

Regarding claim 1; Prior Art of Present Invention discloses a method, comprising:

(a) providing a substrate (14 of figure 2) with an organic or inorganic layer formed thereon;

(b) performing a spectral ellipsometer measurement (figure 6) and a broadband spectrometer measurement (figure 6) of said substrate (14 of figure 2 or 30 of figure 6) organic or inorganic layer in an integrated optical measurement system (31 of figure 6) ;

(c) determining a thickness substrate (14 of figure 2 and page 5 paragraph 2) by a fit model data to experimental data (36 of figure 6) coupled to an experimental data output (33) and a modeling of film stack information (34, 35 of figure 6) for said organic or inorganic layer; and

(d) determining values of said thickness substrate (14 of figure 2) by a best fit of data (37 of figure 6) coupled to an output values device (38 of figure 6) for said organic or inorganic layer based on said thickness, with the spectral ellipsometer measurement, the broadband spectrometer measurement, and modeling information (31, 34, 35 of figure 6). See figures 1-3 and 6 and pages 1-5.

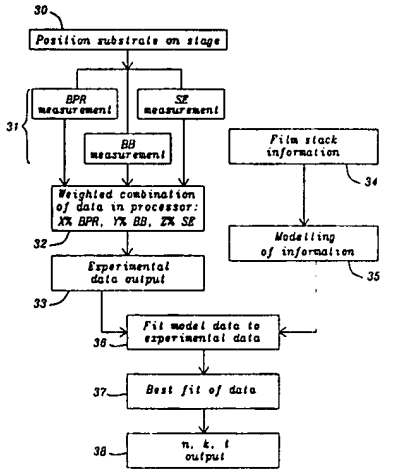

FIG. 6 – Prior Art

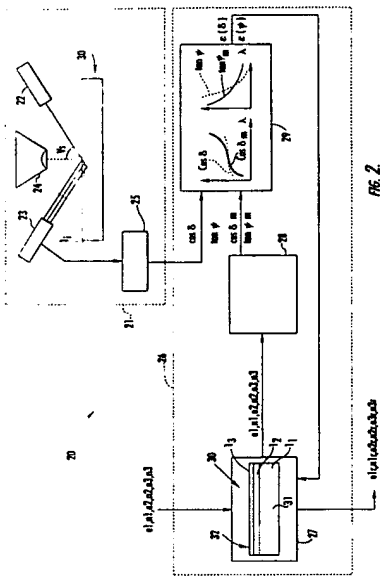

FIG. 2

PAPI discloses all of features of claimed invention except for determining a thickness of an organic or inorganic layer formed a substrate. However, Pinaton et al teaches that it is known in the art to provide a computation unit (26 of figure 2) for determining a thickness of an organic or inorganic layer (l_i, 32 of 2) formed a substrate (30, 31 of figure 2 and abstract and col.5 lines 47 to col.6 lines 20). See figures 2-7.

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to combine PAPI's method with determining a thickness of an organic or inorganic layer formed a substrate as taught by Pinaton et al for the purpose of measuring high sensitivity to the two essential parameters of dose and energy over a wide range of values of the parameters and implementing using recyclable test wafers.

Regarding claims 3-4, 15-16, and 24; PAPI discloses the independent optical thickness measurement component (figure 6) is based on Beam Profile Reflectometry (BPR) or Beam Profile Ellipsometry (BPE).

Regarding claims 5 and 17; PAPI discloses the integrated optical measurement system is an Opti-Probe series measurement system from Therma-Wave or a system with equivalent capability (see page 3 paragraph 2 and page 4 first paragraph).

Regarding claim 6; figure 6 of PAPI discloses the independent optical thickness measurement component (BPR of figure 6) provides experimental data (33 of figure 6) in the form of beam profiles that are matched to modeling data (36 of figure 6) in a processor to arrive at a best fit of experimental data to modeling data (37, 38 of figure 6).

Regarding claims 8, 19, and 25; PAPI discloses said thickness data is combined with measurement data from said SE and BB measurements (31 of figure 6) to provide an experimental data output (32 of figure 6) for said organic or inorganic layer.

Regarding cl aims 9, 20, and 26; PAPI discloses said experimental data output (32 of figure 6) is fitted to modeling data (36 of figure 6) to provide a best fit of experimental data (37 of figure 6) to modeling data.

Regarding claims 10, 21, and 27; PAPI discloses said best fit of experimental data (37 of figure 6) to modeling data provides n and k values for said organic or inorganic layer (38 of figure 6).

Regarding claims 11, 22, and 28; PAPI in view of Pination et al discloses all of features of claimed invention except for said organic or inorganic layer is a 248 nm photoresist, a 193 nm photoresist, or an anti-reflective (ARC) layer. It would have been obvious to one having ordinary skill in the art at the time theinvention was made to combine PAPI's method with said organic or inorganic layer is a 248 nm photoresist, a 193 nm photoresist, or an anti-reflective (ARC) layer, since it has been held that the general conditions of a claim are disclosed in the prior art, discovering the optimum or working ranges involves only skill in the art. In re Aller, 105 USPQ 223.

Regarding claim 12; PAPI discloses all of features of claimed invention as **indicated above claim 1**, except for a substrate having a stack of layers comprised of a top photoresist layer and a bottom layer formed thereon, inputting a thickness and values of the bottom layer into a program used to make calculations, and determining values thickness of the top photoresist layer based on data that includes the thickness of the top photoresist layer. However, Pinaton et al teaches that it is known in the art to provide a substrate (30 of figure 2) having a stack of layers (col.5 lines 28-30, for example, a plurality of superimposed parallel layers) comprised of a top photoresist layer (i.e., upper layer L_3 and see col. 6 lines 18-19) and a bottom layer (i.e., lower layer L_1 and see col.6 lines 14-15) formed thereon, inputting a thickness and values of the bottom layer into a program used to make calculations by computation unit (26 of figure 2 and col. 5 line 47 to col.6 line 20), and determining values thickness of the top photoresist layer based on data that includes the thickness of the top photoresist layer(col.6 lines 21-37) . See figures 2-7. Therefore, it would have been obvious to one

having ordinary skill in the art at the time the invention was made to combine PAPI's method with a substrate having a stack of layers comprised of a top photoresist layer and a bottom layer formed thereon, inputting a thickness values of the bottom layer into a program used to make calculations, and determining values thickness of the top photoresist layer based on data that includes the thickness of the top photoresist layer as taught by Pinaton et al for the purpose of measuring high sensitivity to the two essential parameters of dose and energy over a wide range of values of the parameters and implementing using recyclable test wafers.

Regarding claim 14; PAPI discloses all of features of claimed invention as indicated **above claims 1 and 12**, except for determining thickness and values of the bottom layer on the substrate. However, Pinaton et al teaches that it is known in the art to provide a bottom layer (i.e., lower layer L_1 and see col.6 lines 14-15) formed the substrate (30 of figure 2) and computation unit (26 of figure 2) coupled to spectrometer (25 of figure 2) for determining thickness and values of the bottom layer (i.e., lower layer L_1 and see col.6 lines 14-15) on the substrate (30 of figure 2 and col.5 lines 47 to col.6 lines 30). It would have been obvious to one having ordinary skill in the art at the time the invention was made to combine PAPI's method with determining thickness and values of the bottom layer on the substrate as taught by Pinaton et al for the purpose of measuring high sensitivity to the two essential parameters of dose and energy over a wide range of values of the parameters and implementing using recyclable test wafers.

Regarding claim 23; PAPI discloses all of features of claimed invention as **indicated above claims 1 and 12**, except for a substrate having a stack of layers

comprised of a bottom inorganic layer, a middle organic layer, and a top photoresist layer formed on thereon, inputting a thickness and values of the bottom inorganic layer and the middle layer into a program used to make calculations. However, Pinaton et al teaches that it is known in the art to provide a substrate (30 of figure 2) having a stack of layers (col.5 lines 28-30, for example, a plurality of superimposed parallel layers) comprised of a bottom inorganic layer (i.e., lower layer L_1 and see col.6 lines 14-15), a middle organic layer (i.e., an intermediate layer L_2 and see col.6 lines 16-17), and a top photoresist layer (i.e., upper layer L_3 and see col. 6 lines 18-19) formed thereon, inputting a thickness and values of the bottom layer (L1) and the middle layer (l2) into a program used to make calculations by computation unit (26 of figure 2 and col. 5 line 47 to col.6 line 20). See figures 2-7. Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to combine PAPI's method with a substrate having a stack of layers comprised of a bottom inorganic layer, a middle organic layer, and a top photoresist layer formed on thereon, inputting a thickness and values of the bottom inorganic layer and the middle layer into a program used to make calculations as taught by Pinaton et al for the purpose of measuring high sensitivity to the two essential parameters of dose and energy over a wide range of values of the parameters and implementing using recyclable test wafers.

Claims 2 and 13 are rejected under 35 U.S.C. 103(a) as being unpatentable over PAPI in view of Pinaton et al as applied to claims 1 and 12 above, and further in view of Coates et al (U.S. Patent No. 4,826,321).

Regarding claims 2 and 13; PAPI in view of Pinaton et al discloses all of features of claimed invention except for said organic or inorganic layer has a thickness in the range of about 300 to 10000 Angstroms or 1000 to 10,000 Angstroms. However, Coates et al teaches that it is known in the art to provide measuring thin film thickness layer (24 of figure 1) has the range of from about to 10 to 1500 Angstroms (abstract and col.1 lines 30-35). It would have been obvious to one having ordinary skill in the art at the time the invention was made to combine PAPI's method with said organic or inorganic layer has a thickness in the range of about 300 to 10000 Angstroms or 1000 to 10,000 Angstroms as taught by Coates et al for the purpose of measuring accuracy thickness on the substrate. Further, it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art. In re Boesch, 617 F.2d 272, 205 USPQ 215 (CCPA 1980).

Claims 7 and 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over PAPI in view of Pinaton et al as applied to claims 1 and 12 above, and further in view of Opsal et al (U.S. Patent No. 6,671,047).

Regarding claims 7 and 18; PAPI in view of Pinaton et al discloses all of features of claimed invention except for discloses a Critical Point model otherwise known as a harmonic oscillator approximation. However, Opsal et al teaches that it is known in the art to provide a Critical Point model otherwise known as a harmonic oscillator approximation (col.7 lines 40-50). It would have been obvious to one having ordinary skill in the art at the time the invention was made to combine PAPI's method

with a Critical Point model otherwise known as a harmonic oscillator approximation as taught by Opsal et al for the purpose of measuring accuracy thickness on the substrate.

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Lee et al (6710889) discloses method for improved dielectric layer metrology calibration; Chen et al (6646752) discloses method and apparatus for measuring thickness of a thin film; Hirosawa (6151116) discloses evaluation method for thin film; Opsal et al (6583876) discloses apparatus for optical measurements of nitrogen concentration in thin film; or Johnson (5452091) discloses scatter correction in reflectivity measurements.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Sang Nguyen whose telephone number is (571) 272-2425. The examiner can normally be reached on 9:30 am to 7:00 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Gregory J. Toatley, Jr. can be reached on (571) 272-2800 ext. 77. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should

you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

June 2, 2006

Sang Nguyen
Patent Examiner
Art Unit 2877